Abstract

The invention provides systems, methods and apparatus for processing delicate parts within a process tank such as an ultrasonic tank. Typically, one or more transducers connect to the tank and respond to drive signals from a generator to produce ultrasound within process liquid within the tank. Specific features of the invention include: (1) a power up-sweep ultrasonic system for moving contaminants upwards within the tank by sweeping transducer drive signals from an upper frequency to a lower frequency without sweeping from the lower frequency to the upper frequency; (2) a multi-generator system for producing ultrasound at selected different frequencies within the tank by switching a common transducer bank to one of the generators in response to remote relays initiated by the user; (3) a probe sensing system for sensing process conditions within the tank including an enclosure for housing a sample liquid and one or more sensing transducers within the sample liquid, the transducers generating signals indicative of characteristics of the sample liquid, a subsystem analyzing the signals in feedback with the generator to modify process conditions; (4) variable voltage ultrasonic generator systems to accommodate varying world-wide voltage supplies; (5) a laminar process tank for efficiently pushing contaminants upwards in a tank; (6) a quick dump rinse tank including a pressure cavity to accelerate dumping processes; (7) an ultrasonic generating unit formed of a printed circuit board (PCB) and multiple transducers within the PCB; (8) an AC power system to produce an AC voltage at frequency f that is impressed across a capacitive element; and (9) various configurations of transducers, including acid-safe transducers, double-compression transducers, and transducers with increased reliability.